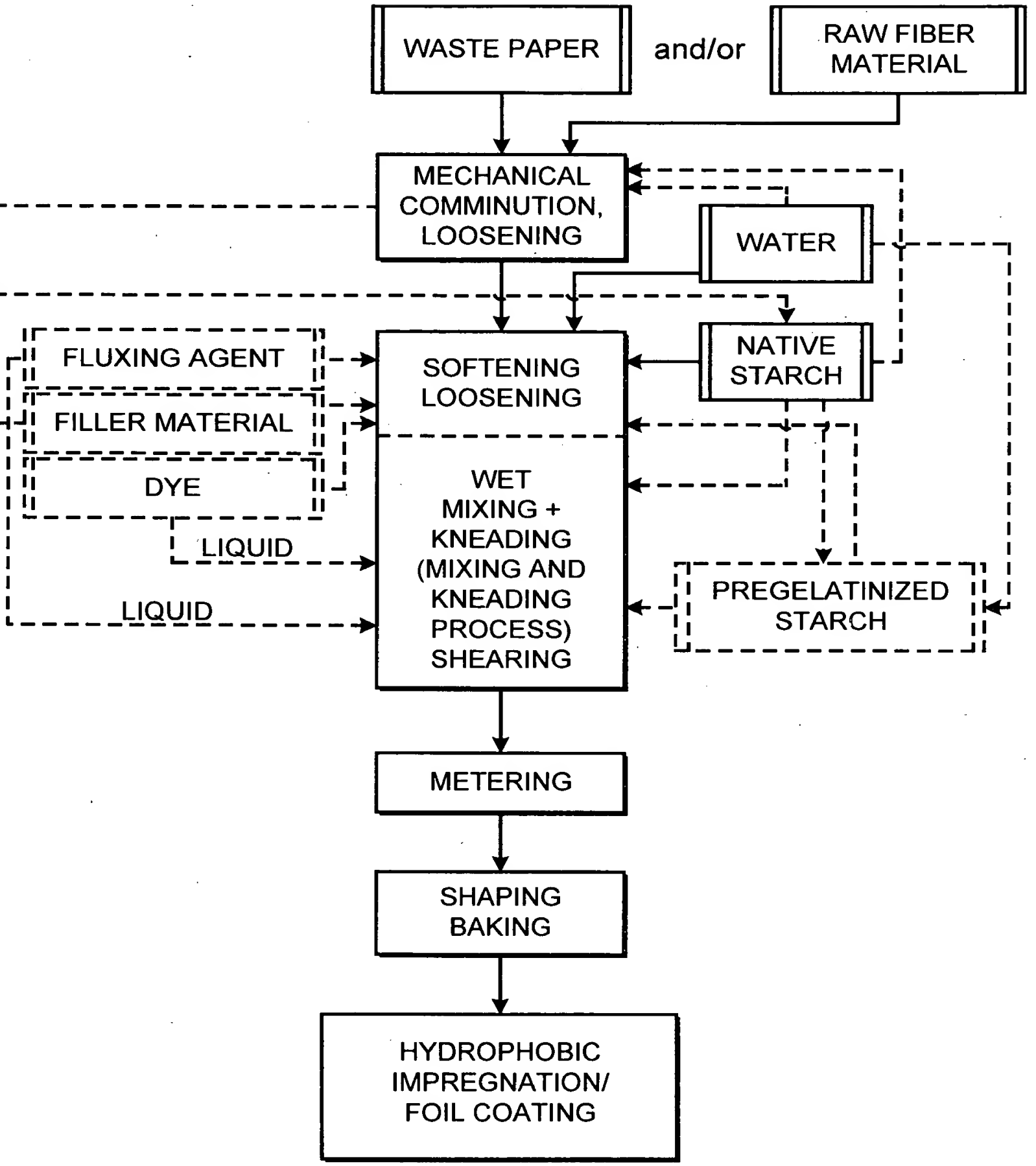


FIG. 1

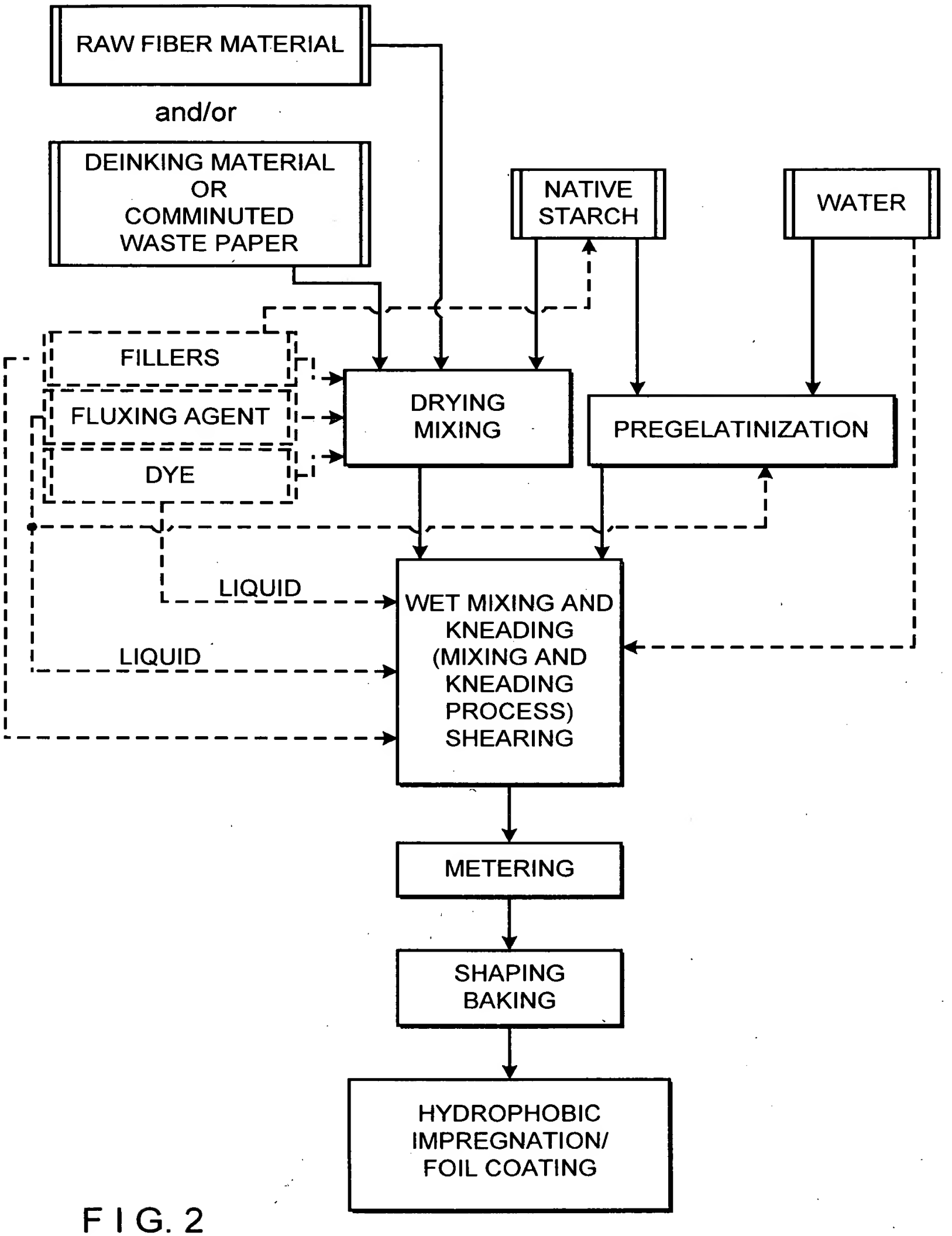
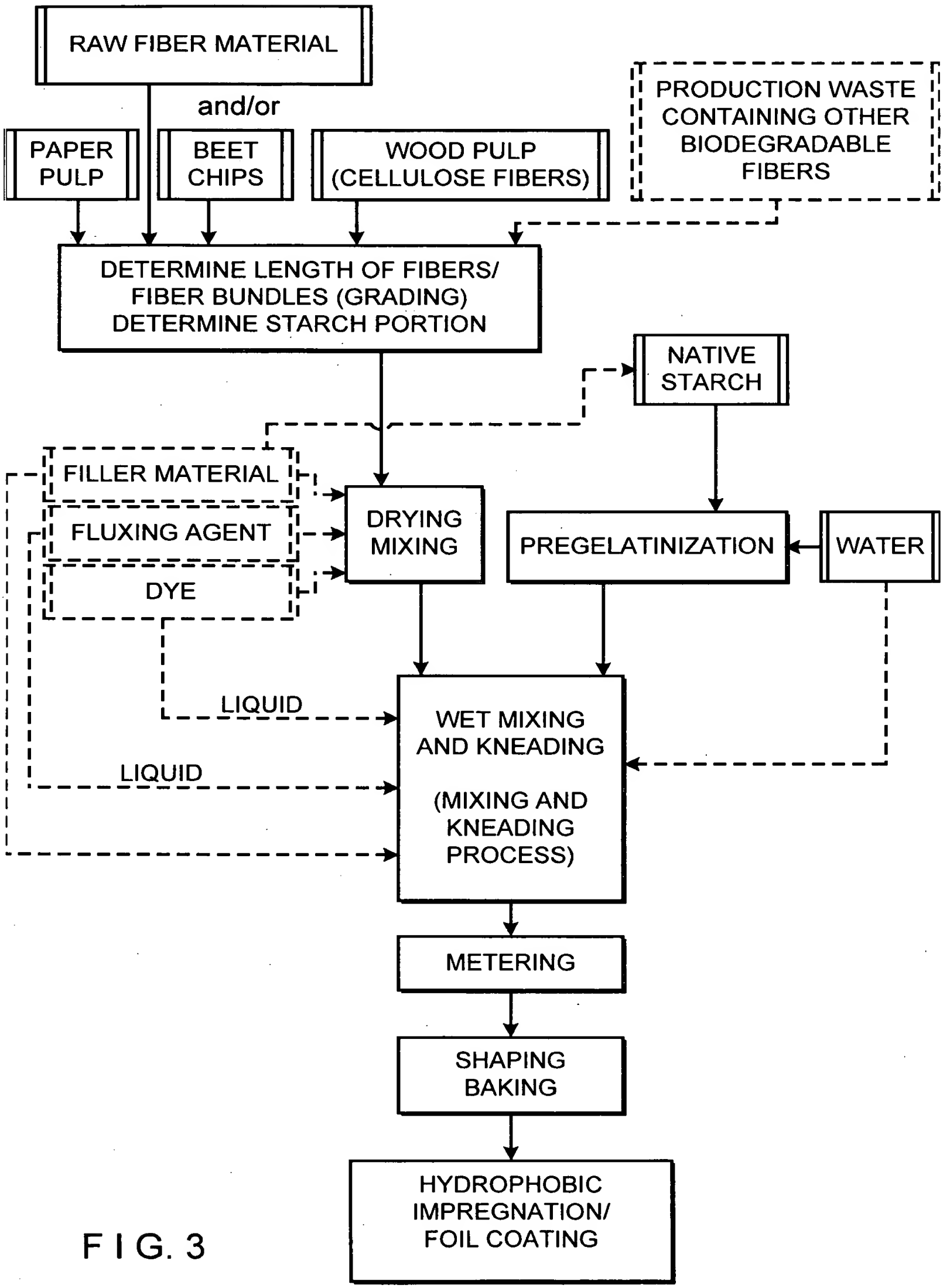


FIG. 2



F I G. 3

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
a	18,7	28,2	37,2	47	56,4	65,6	75	84,3	93,3	102,9	112,3	122	131,4	140,8	150

$X_{1\text{-}15}$ test sample

a in wt. % native starch

b = 250 wt. % water (in relation to dry mass of fiber material)

c = 100 wt. % fiber material

F I G. 4a

native starch

test sample	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	y11	y12	y13	y14	y15
a	25	84	113	131	150	169	188	206	225	244	283	281	300	150	75

a = native starch in percent by weight

b = 500 wt. % water in relation to fiber material (dry substance)

c = 100% fiber material

F I G. 4b

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
a	18,7	28,2	37,3	47	56,4	65,8	75	84,3	93,3	102,9	112,3	122	131,4	140,8	150
d	6,3	9,1	12,7	15,7	18,8	21,9	25	28,3	31,3	34,9	37,7	40,7	43,8	46,9	50
e	24,9	37,8	50	62,7	75,2	87,7	100	112,7	124,7	137,8	150	162,7	175,2	187,7	200

$X_{1\text{-}15}$ test sample

a in wt. % native starch

d in wt. % pregelatinized starch

e in wt. % total starch

b = 250 wt. % water (in relation to dry mass of fiber material)

c = 100 wt. % fiber material

F I G. 5a

ratios

test sample															
	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	y11	y12	y13	y14	y15
a	25	94	113	131	150	169	188	205	225	244	283	261	300	150	75
d	75	31	38	44	50	58	63	69	75	81	86	94	100	100	100
	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400

a = native starch in wt. %

d = pregelatinized starch in wt. %

e = total starch in wt. %

b = 500 wt. % water in relation to fiber material (dry substance)

c = 100% fiber material

F I G. 5b

Grade	Long fibers/ fiber bundles [mm]
1	0.96 - 1.44
2	1.92 - 2.40
3	2.40 - 2.88
4	0.72 - 2.16
5	3.06 - 3.57
6	2.55 - 4.59
7	0.24 - 1.68
8	0.24 - 4.32

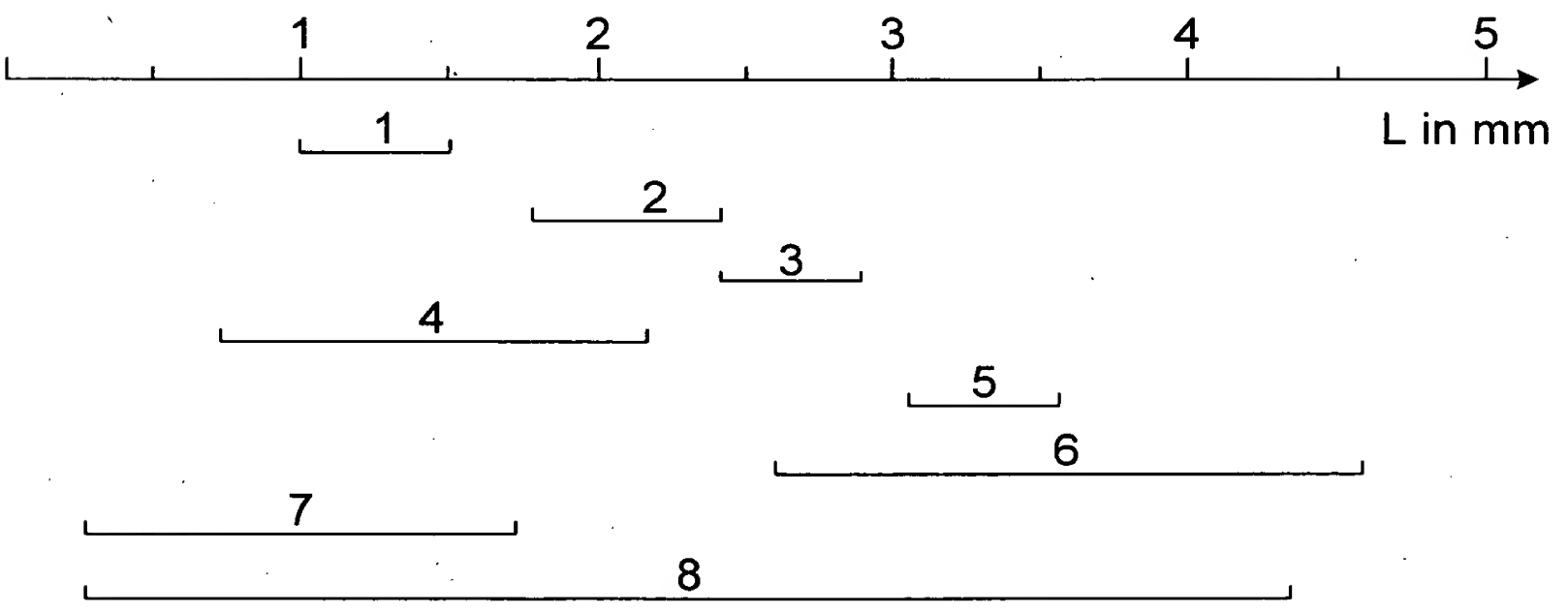


FIG. 6

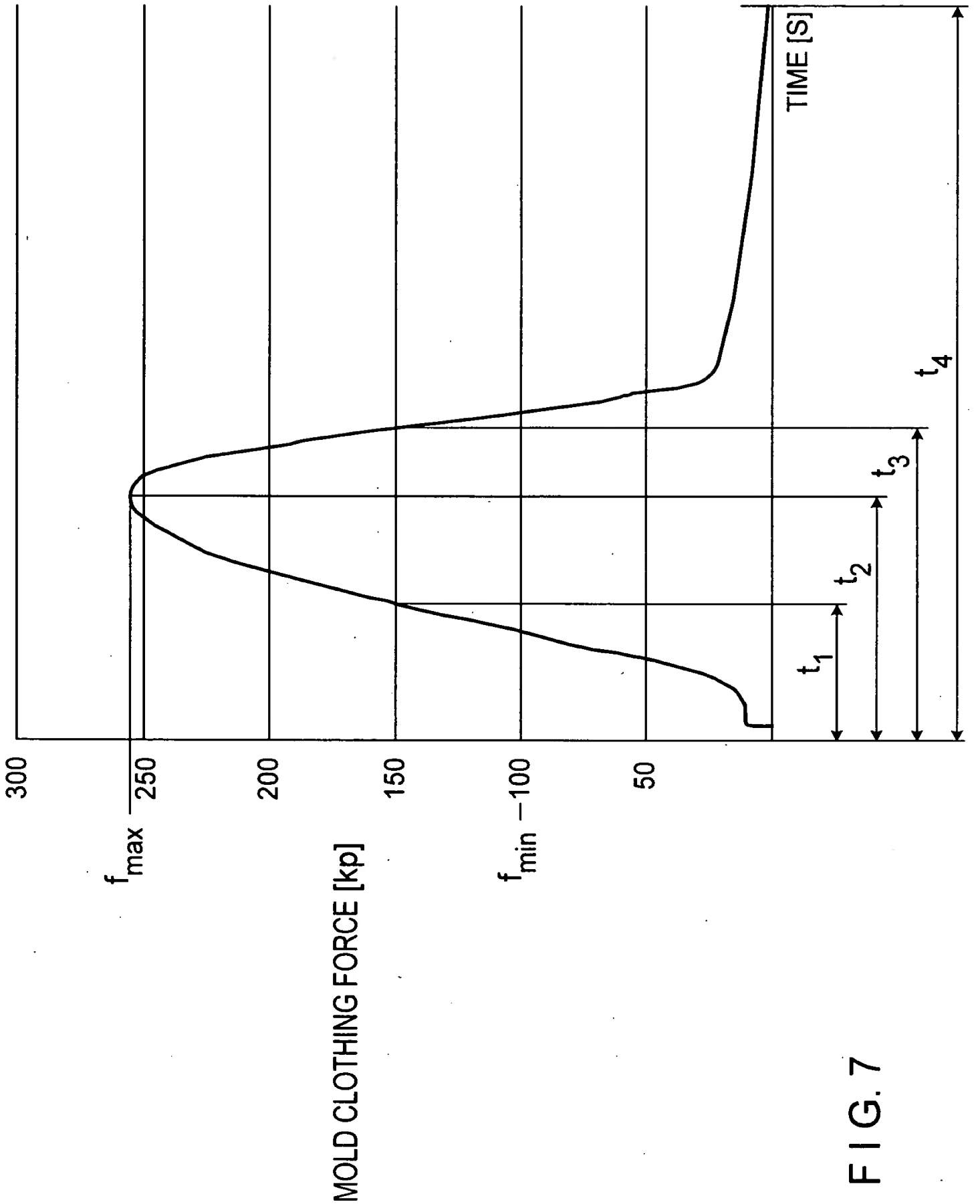


FIG. 7

Use of fibers (fiber bundles) graded by fiber length according to Fig. 6

mold depth	=30 mm								= 50 mm							
fiber length	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
surface/ texture	+	+	+	+	+	-	+	-	+	+	+	+	+	+	+	-
strength/ stability	-	-	-	+	-	-	+	+	-	-	-	+	-	+	+	+
elasticity/ structure	-	-	-	+	-	+	+	+	-	-	-	+	-	+	+	+

mold depth	= 80 mm								> 80 mm							
fiber length	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
surface/ texture	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
strength/ stability	-	-	-	+	-	+	+	+	-	-	-	+	-	+	+	+
elasticity/ structure	-	-	-	+	-	+	+	+	-	-	-	+	-	+	+	+

+ molded body according to requirements
- molded body not according to requirements

F I G. 8

Use of fibers mixtures of different fiber length according to Fig. 6

mold depth	= 30 mm		= 50 mm		= 80 mm		> 80 mm		
combination of fiber length according to Fig. 6	7 + 4	4 + 2	7 + 2 + 3	4 + 2 + 3	8	7 + 2 + 3 + 5	8	7 + 2 + 6	8 + 6
surface/ texture	-	+	-	+	+	-	+	-	+
strength/ stability	+	+	+	+	+	+	+	+	+
elasticity/ structure	-	+	+	-	+	+	+	+	+
fiber material/ starch	60 : 40		55 : 45		50 : 50		45 : 55		
starch/water	0,4 : 1		0,4 : 1		0,4 : 1		0,3 : 1		

+ molded body according to requirements
- molded body not according to requirements

FIG. 9

in wt. %	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
fiber material to total mass	26,7	25,8	25	24,2	23,5	22,8	22,2	21,6	21,1	20,5	20	19,5	19	10,6	18,2
total starch to total mass	6,6	9,7	12,5	15,2	17.7	20,1	22,2	24,3	26,2	28,2	10	11,7	33,4	34,9	16,3
water to total mass	66,7	64,5	62,5	60,6	58,8	57,1	55,6	54,1	52,7	51,1	50	48,8	47,6	46,5	15,5
pragelatinized starch to total mass	1,6	2,4	3,2	3,8	4,4	5	5,5	6,1	6,6	7,1	7,5	7,9	8,4	8,7	9

X_{1-15} test sample

FIG. 10

Percent by weight in mass

in wt. %	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	y11	y12	y13	y14	y15
fiber/mass	14,3	13,8	13,3	12,9	12,5	12,1	11,8	11,4	11,1	10,8	10,5	10,3	10,0	11,8	12,9
total starch/ mass	14,3	17,2	20,0	22,6	25,0	27,3	29,4	31,4	33,3	35,1	36,8	38,5	40,0	29,4	22,6
pregelatinized starch/mass	10,7	4,3	5,0	5,6	6,3	6,6	7,4	7,9	8,3	8,8	9,2	9,6	10,0	11,8	12,9
water/mass	71,4	69,0	68,7	64,5	62,5	60,8	58,3	57,1	55,6	54,1	52,8	51,3	50,0	58,8	64,5

y1-15 = test sample

FIG. 11

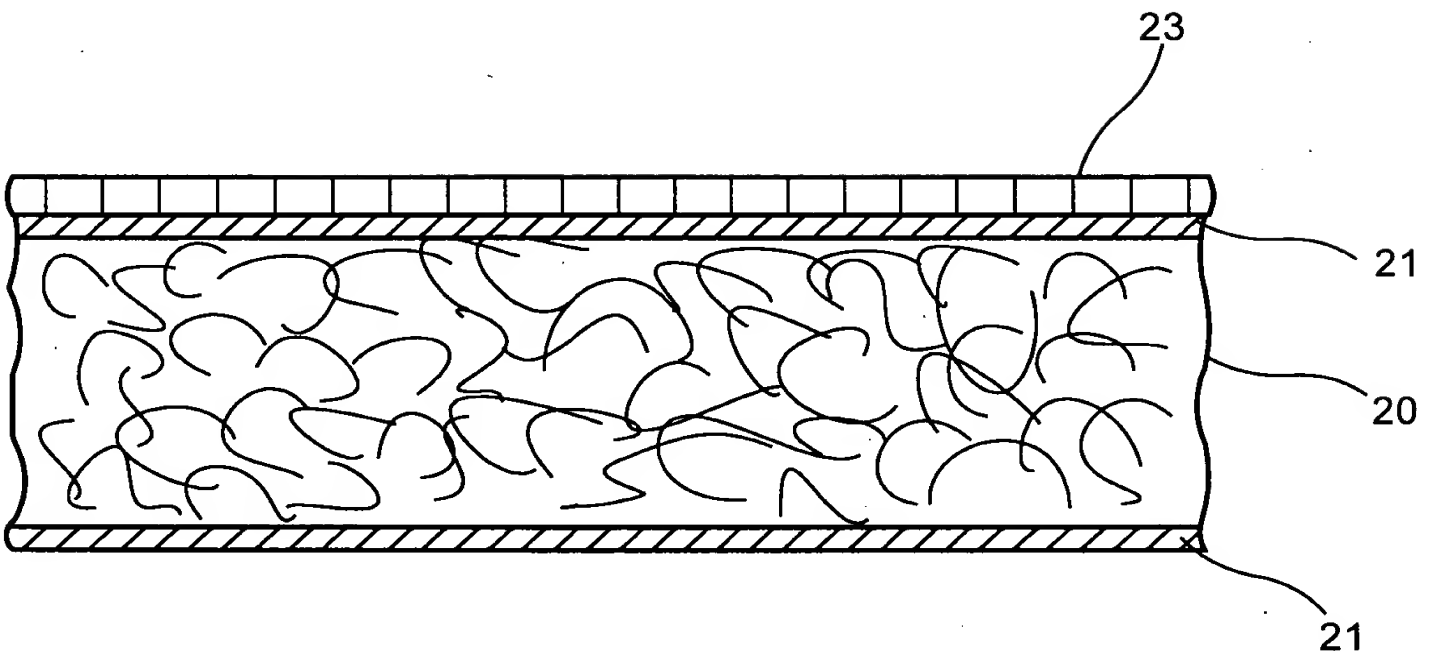


FIG. 12

Trays dimensions 112 x 200 x 17.5 mm

Pots dimensions ϕ 125 mm, vol. 500 ml, height 76 mm

Recipe: Y14
Coating: cellulose acetate (CA)
TS: 4.5% - 15 wt. % dry substance in spray solution
η: 20 - 4000 mPas (viscosity)
Application: spraying, casting, dipping

Layers: 1 - 3 (quantity)

Solvent: acetone

Shape	Thick-ness	Coating	Method	Resistance		
				water 100°C 1h	oil (cold) 3 days	water (cold) 3 days
pot	89 µm	3.8 g	casting	+	+	+
tray	79 µm	2.3 g	casting	+	+	+
pot	65 µm	2.8 g	spraying	+	+	+
tray	68 µm	2.0 g	spraying	+	+	+
tray	58 µm	1.7 g	spraying	+	+	+
pot	34 µm	1.5 g	spraying	-	-	-
tray	27 µm	0.8 g	spraying	-	-	-

FIG. 13

Trays dimensions 112 x 200 x 17.5 mm

Pots dimensions ϕ 125 mm, vol. 500 ml, height 76 mm

Recipe: Y14
Coating: cellulose acetate propionate (CAP)
TS: 9% - 2o wt. % dry substance in spray solution
η: 200 - 6000 mPas (viscosity)
Application: spraying, casting, dipping

Layers: 1 - 3 (quantity)

Solvent: acetone

Shape	Thickness	Method	Resistance		
			water 100°C 1h	oil cold 3 days	water cold 3 days
pot	88 µm	casting	+	+	+
tray	88 µm	casting	+	+	+
pot	58 µm	spraying	+	+	+
tray	70 µm	spraying	+	+	+
tray	56 µm	spraying	+	+	+
pot	33 µm	spraying	-	-	-
tray	22 µm	spraying	-	-	-

FIG. 14

Trays dimensions 112 x 200 x 17.5 mm

Pots dimensions ϕ 125 mm, vol. 500 ml, height 76 mm

No.	Foil	Thick-ness	Deep-drawing quality in tray	Deep-drawing quality in tray	Resistance		
					water 100°C	oil cold	water cold
1	polyester amide	100 µm	+	-	-	+	+
		150 µm	+	-	—	+	+
2	polyester	70 µm	+	-	—	+	+
3	polylactic acid (rigid)	50 µm	-	-	-	+	+
		100 µm	-	-	-	+	+
4	polylactic acid (elast.)	50 µm	+	-	+	+	+
		100 µm	+	+	+	+	+

Foil	Melting point
1	approx. 120°C
2	approx. 85°C
3	approx. 115°C
4	approx. 130°C

FIG. 15

Cellulose acetate / Cellulose acetate propionate

	Softener 10 - 30 wt. %				
	Diethyl - phthalate	Triacetin	Tributyl citrate	Acetyl tributyl citrate	Without softener
CA	V + / H +	V + / H +	V - / H -	V - / H -	H O
CAP	V + / H +	V + / H +	V + / H +	V + / H +	H +

Key: + = good o = medium - = poor

V = compatibility H = adhesion

F I G. 16

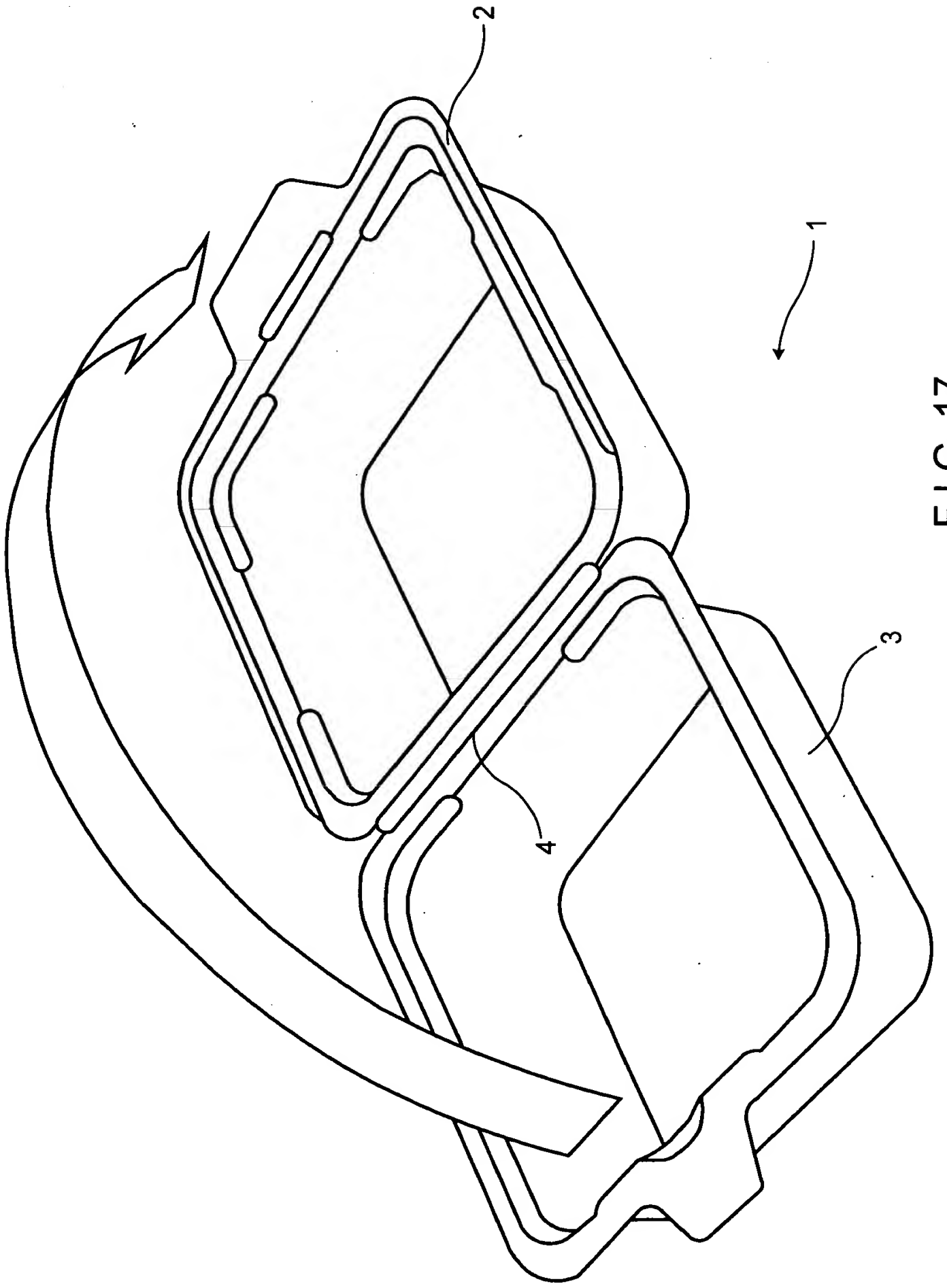


FIG. 17

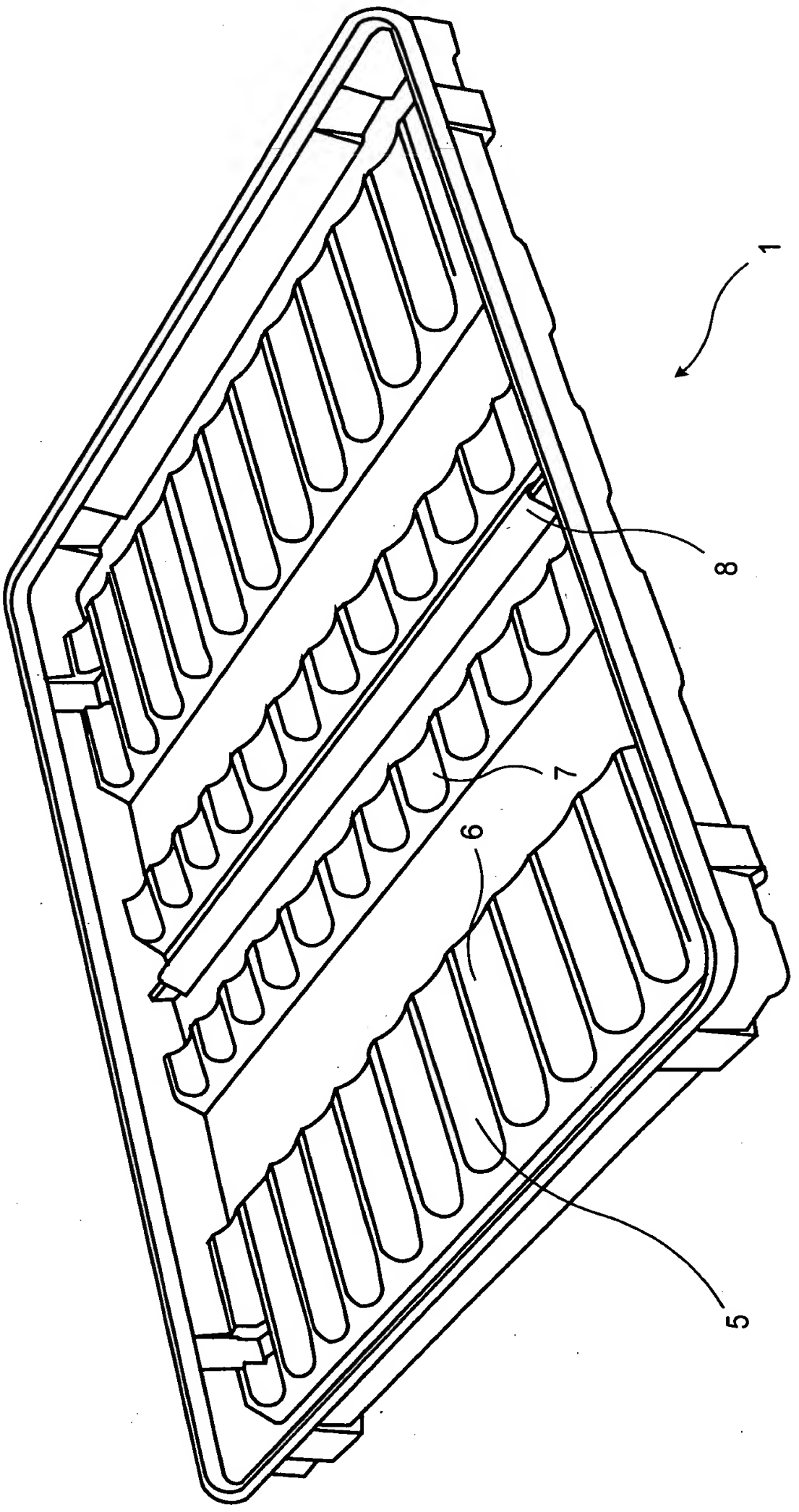


FIG. 18

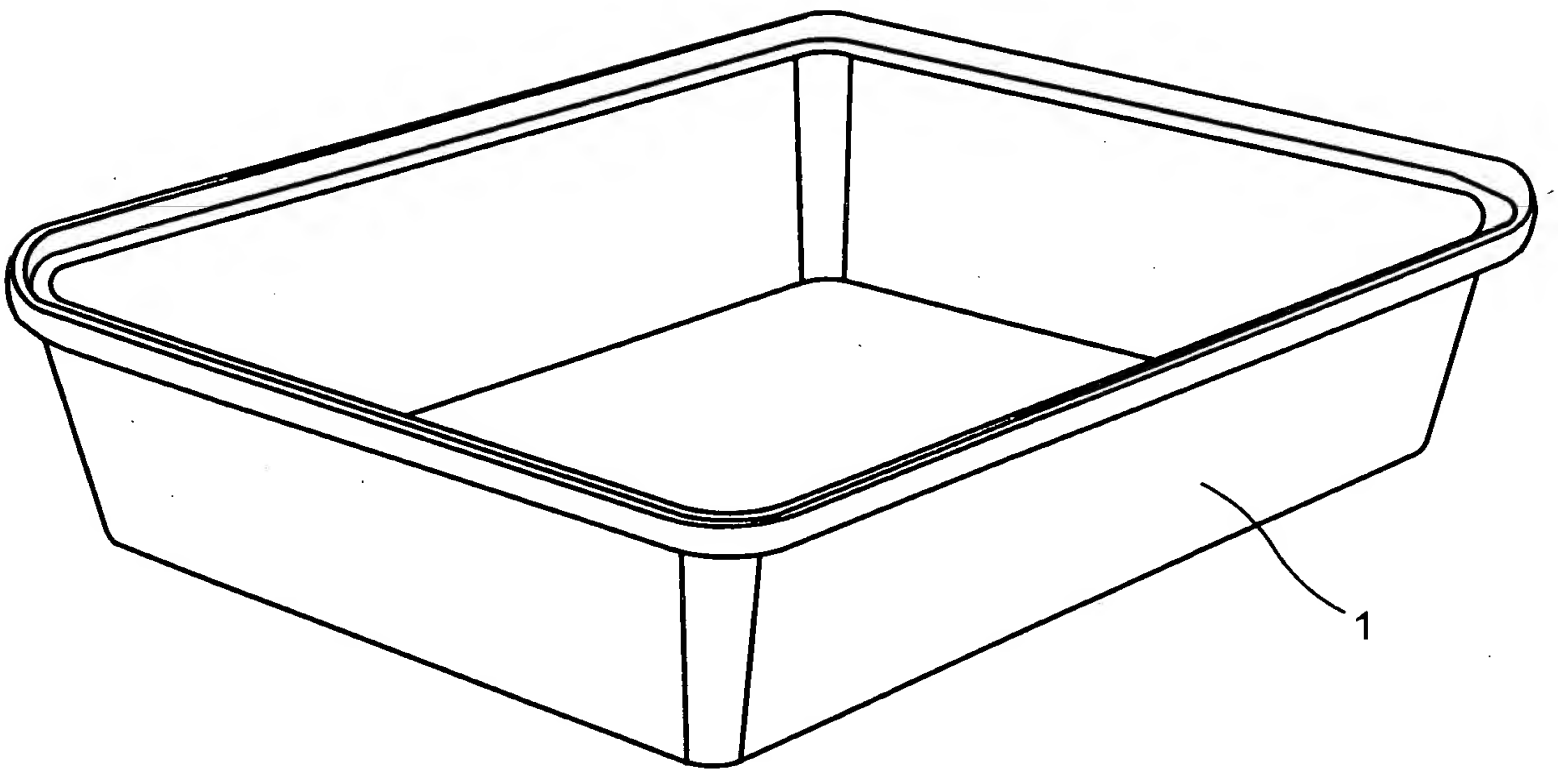


FIG. 19

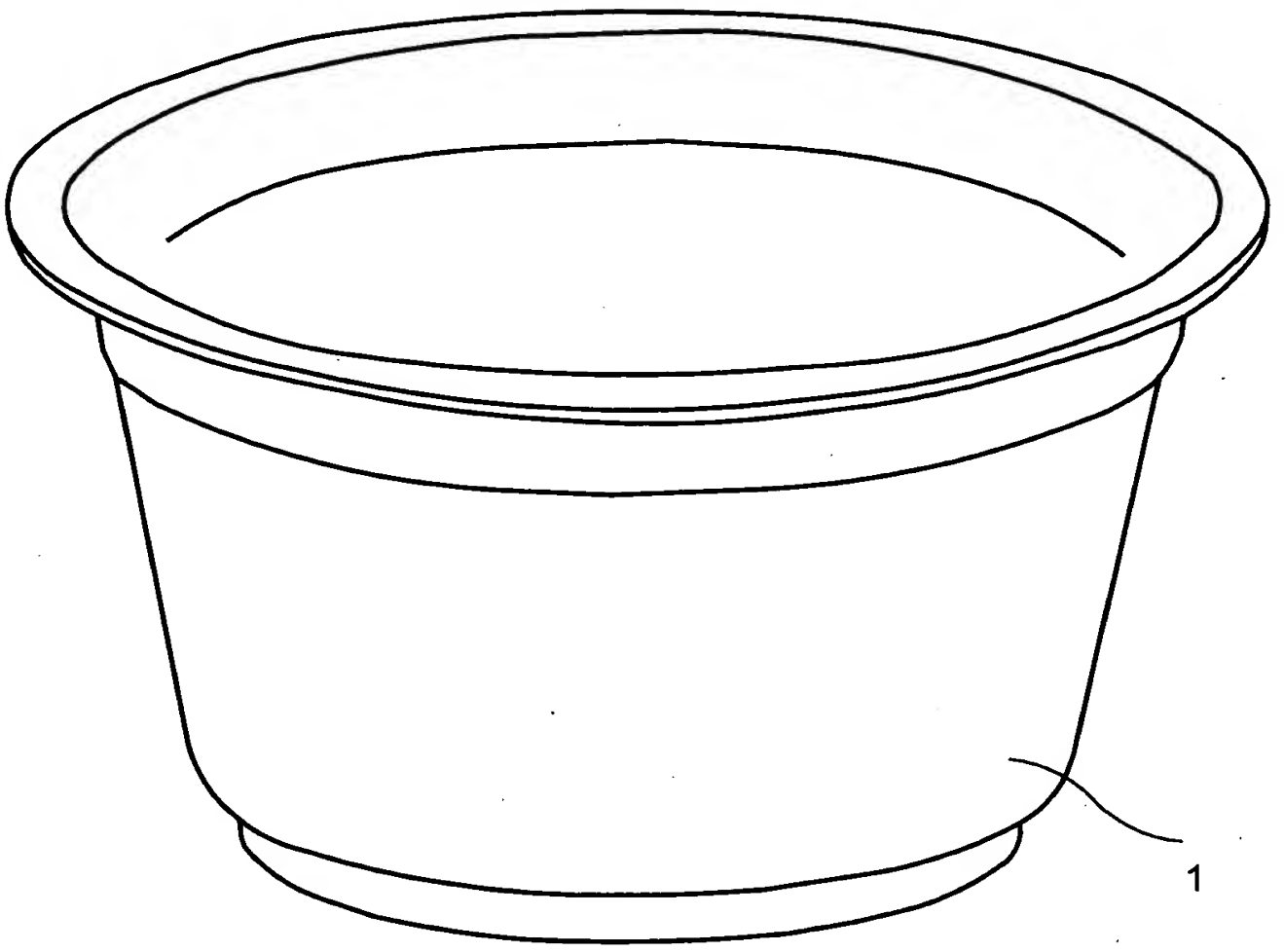


FIG. 20